

North American Species of Calosota Curtis
(Hymenoptera: Eupelmidae)

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ABSTRACT

A revision of the North American species of the eupelmid genus *Calosota* is presented. A key, illustrations, and descriptions of the 2 known (*C. longiventris*, *C. metallica*) and 3 new (*C. pseudotsugae*, *C. kentra*, *C. montana*) species are included. Most of the species of *Calosota* for which hosts are known parasitize wood-boring Coleoptera.

The species of *Calosota* have a distinctive appearance, with the pronotum greatly reduced, the mesoscutum and praescutum fused into a semi-quadrate sclerome that shows hardly any traces of the notaulices, the axillae greatly reduced and widely separated, and the body elongate and slender, resembling in habitus many of the genera of the Cleonymini of the Pteromalidae. *Calosota* species do not look, at first glance, like eupelmids.

Yet *Calosota* is an eupelmid genus. The mid coxae are attached in such a way that they can be rotated either anteriorly or posteriorly, the mid tibia has a saltatorial apical spur, the basal mid tarsal segments are enlarged and bear ventral spines or teeth, the mesopleuron lacks a femoral furrow, and the prepectus is enlarged and projects over the anterior margin of the mesepisternum.

Bouček (1958, p. 354) has proposed a subfamily Calosotinae in the Eupelmidae for *Calosota* and a few allied genera. Bolívar y Peltain (1923, 1929) has twice revised the Spanish species of *Calosota*, and Hedqvist (1963, p. 138) has recharac-

terized the genus. *Calosota* occurs in all faunal regions and is especially well represented in the Oriental region. Most of the species of *Calosota* for which hosts are known parasitize wood-boring Coleoptera.

Up to now, 2 species of *Calosota* have been known for North America. In this paper I describe 3 more and give a key and descriptions for the separation of all the North American species. I undertook the revision of this interesting little genus when Mr. M. A. Deyrup of Washington State submitted a series of an undescribed species for which he needed a name.

Genus *Calosota* Curtis

Calosota Curtis, 1836, Brit. Ent. 13: 596.—Ruschka, 1920, Verh. Zool.—Bot. Ges. 70: 248.—Gahan and Fagan, 1923, U.S. Natl. Mus. Bul. 124: 26.—Bolívar y Peltain, 1923, Rev. Fitopat. 1: 62.—Bolívar y Peltain, 1929, Eos 5: 123.—Peck in Muesebeck et al., 1951, U. S. Dept. Agr. Monog. 2: 508.—Nikolskaya, 1952, Opred. Fauna S.S.S.R. 44: 480.—Hedqvist, 1956, Ent. Tidskr. 77: 96.—Bouček in Kratochvíl, 1957, Klíč Zvířeny ČSR 2: 244.—Hedqvist, 1963, Studia Forest. Suec. 11: 139.—Nikolskaya, 1963, Keys Fauna U.S.S.R.

44: 493 (Eng. transl.).—Bouček, 1964, Ent. Soc. Canada Mem. 34: 60 (Eng. transl.).—De Santis, 1967, Buenos Aires Com. Inv. Cient., Cat. Him. Arg., Ser. Par., p. 172.

Type-species.—*Calosota vernalis* Curtis. Orig. desig.

Calosoter Walker, 1837, Ent. Mag. 4: 358.—Ashmead, 1896, Proc. Ent. Soc. Wash. 4: 7, 10.—Dalla Torre, 1898, Cat. Hym. 5: 270.—Ashmead, 1904, Carnegie Mus. Mem. 1: 288, 290.—Schmiedeknecht, 1909, Gen. Ins., fasc. 97: 172, 174, 184.—Gahan, 1922, Proc. U.S. Natl. Mus. 61 (24): 16.—Risbec, 1952, Mem. Inst. Sci. Madagascar, ser. E, 2: 61, 132.

Type-species.—*Calosoter vernalis* Walker. Desig. by Westwood, 1840.

Generic description.—Eyes large, pubescent; antennae inserted at or slightly below level of ventral margins of compound eyes; malar furrow present; margins of clypeus indistinct; anterior ocellus located outside scrobe cavity; surface within scrobe cavity mostly or entirely shining and smooth, rest of frons sculptured; face and ventral half of parascrobal spaces pubescent; antenna lacking true ring segments, but first funicular segment shorter than second, being 2/5 to 4/5 as long as second segment, 8 funicular segments present. Pronotum reduced in size, scarcely visible from dorsal aspect, laterally with a more or less distinct femoral furrow; notaulices absent or faintly indicated anteriorly; axillae small and widely separated; mid coxae attached so as to rotate either anteriorly or posteriorly, mid tibia with an apical, saltatorial spur, mid tarsus with basal segments thickened and bearing ventral teeth or spines in 2 parallel, longitudinal rows; hind tibia with 2 apical spurs, mesopleuron without femoral furrow; forewing with basal cell completely setose, speculum present or absent. Propodeum in female extremely short on meson, posterior margin almost or quite in contact with anterior margin, in male propodeum slightly longer on meson; propodeal spiracles large and round.

Gaster of female long and slender, with apical tergum acuminate, ovipositor often projecting; basal 2 to 5 gastral terga in female with posterior margins emarginate on meson, male usually with only first tergum emarginate.

Calosota pseudotsugae, new species

This species differs from all other North American species in having a longitudinal speculum in the forewing below the base of the marginal vein, fig. 1; other species either lack a speculum or have it lying parallel to the basal vein (path of obsolete vein Rs).

Female.—Length 3.0–4.0 mm. Head with metallic bronzy luster, shading to green on meson below antennal sockets; antennal scape yellow at base, black with faint metallic green luster apically, pedicel and flagellum black; mesoscutum blue-green, praescutum bronze color; scutellum black with very faint metallic green luster; propodeum blue-green; gaster black, faintly iridescent laterally; wings hyaline, veins tan; coxae dark blue-green, anterior femora and tibiae black with bases and apices yellow, mid and hind femora and tibiae tan, all tarsi tan. All pubescence silvery.

Antennae inserted at level of ventral margins of compound eyes; basal funicular segments slender and elongate, apical ones relatively shorter and broader but not quadrate, pedicel 3 times as long as first funicular segment, second to sixth funiculars equal in length and each twice as long as first, seventh and eighth equal in length and each 7/8 as long as sixth, club as long as apical 3 funiculars, first club segment 2/5 length of club; width of malar space 1/2 as great as height of compound eye; ocellular line 1/6 as long as postocellar line.

Entire thoracic dorsum with slightly irregular, netlike sculpture, this formed of minute, raised lines, netlike figures slightly larger on meson than

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Key to Females

1. Forewing with a longitudinal speculum below base of marginal vein, fig. 1 *pseudotsugae*, new species
Forewing either lacking a speculum or having one parallel to basal vein (path of obsolete vein Rs), fig. 3 2
2. Scutellum not flat, but roundly elevated in posterior half, its surface sculpture closely set, slightly irregular, longitudinal carinulae; head and body mostly bright metallic blue or blue-green *metallica* Gahan
Scutellum flattened, its surface sculpture netlike; head and body black or black with dark metallic green, bronze, or lavender luster 3
3. Gaster elongate and acuminate, 5 times as long as thorax, and with seventh gastral tergum much longer than sixth *longiventris* Ashmead
Gaster shorter, not over 2-1/2 times as long as thorax, and with seventh tergum equal to or shorter than sixth 4
4. Forewing shaded with tan; thorax black, without metallic luster; forewing without speculum *kentra*, new species
Forewing hyaline; thorax dorsally with metallic blue in longitudinal lateral and median stripes a pair of submedian bronze colored stripes lying between the blue ones; forewing with speculum, fig. 3 *montana*, new species

elsewhere; prepectus with similar sculpture; mesopleuron with minute, netlike sculpture anteriorly, sculpture becoming fainter posteriorly, this posterior sculpture a plexus of minute, closely-set, lineolate engraved lines; forewing with marginal vein twice as long as stigmal, $1\frac{2}{5}$ times as long as postmarginal; a longitudinal speculum present below base of marginal vein, fig. 1; scutellum flattened.

Propodeum with a median smooth area as wide as scutellum, this smooth area containing 2 or 3 strong, longitudinal carinae on each side of meson, rest of propodeal surface minutely shagreened; posterior margin of propodeum a low lamina on meson, carinate elsewhere, posterior and anterior propodeal margins just in contact at meson; each spiracle situated in a depression that is completely surrounded by a low ridge. Gaster slender, acuminate, $2\frac{1}{2}$ times as long as thorax; sixth and seventh gastral terga equal in length; ovipositor slightly exerted.

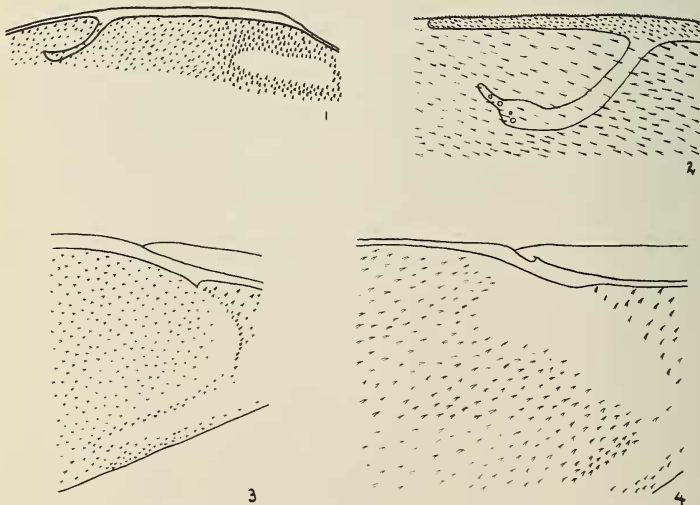
Male.—Length 4.0 mm. Color as in female, except that propodeum is entirely black. Antennae with scape broader than in female, pedicel twice as long as first funicular, second to sixth funiculars equal in length and each as long as pedicel, seventh and eighth each $\frac{7}{8}$ as long as sixth, club as long as sixth and seventh combined; propodeum with entire surface shagreened and as long on meson

as postscutellum; a shield-shaped figure on meson of propodeum formed by a pair of parenthesis-shaped, longitudinal carinae, numerous irregular, longitudinal carinulae in this shield-shaped area; gaster $1\frac{3}{4}$ times as long as thorax.

Type-locality.—Maytown, Thurston Co., Washington.

Type.—U. S. N. M. Catalog No. 72481.

Described from 5 female, 1 male specimens. Holotype female, allotype male, and 4 female paratypes, Maytown, Washington, reared April 6 -12, 1972, from material of downed *Pseudotsuga menziesii* that also yielded specimens of the beetle *Pseudohylesinus nebulosus* (LeConte), Hymenoptera *Spathius sequoiae* Ashmead, *Heydenia unica* Cook and Davis, *Cecidostiba thomsoni* Crawford, *Eurytoma tomici* Ashmead and *E. cleri* Ashmead, and the dipteran *Medetera aldrichii* Wheeler. The rearing was done by M. A. Deyrup.



Figs. 1-4 Portions of forewings of species of *Calosota*. 1, *pseudotsugae*, n. sp., showing longitudinal speculum below base of marginal vein; 2, *kenra*, n. sp., stigmal vein; 3, *montana*, n. sp., showing narrow speculum parallel to basal vein; 4, *metallica* (Gahan), showing large speculum.

Biological relationships.—This species probably is a primary parasite of the scolytid beetle *Pseudohylesinus nebulosus* (LeConte).

Calosota metallica (Gahan)

Calosoter metallicus Gahan, 1922, Proc. U.S. Natl. Mus. 61(24): 16, ♀, ♂.
Calosota metallica (Gahan) Packard, 1928, U.S. Dept. Agr. Tech. Bul. 81: 14.—Gahan, 1933, U.S. Dept. Agr. Misc. Pub. 174: 58.—Knowlton and Jones, 1933, Utah Agr. Expt. Sta. Bul. 243: 12.—Rockwood and Reeher, 1933, U.S. Dept. Agr. Tech. Bul. 361: 18.—Phillips and Poos, 1937, U.S. Dept. Agr. Farmers Bul. 1323: 8.—Knowlton and Harmston, 1939, Proc. Utah Acad. Sci. 16: 62.—Chamberlin, 1941, U.S. Dept. Agr. Tech. Bul. 784: 39.—Peck in Muesebeck et al., 1951, U.S. Dept. Agr. Monog. 2: 508.—Nikolskaya, 1952, Oprel. Fauna S.S.S.R. 44: 483.—Phillips and Poos, 1953, U.S. Dept. Agr. Farmers Bul. 1323 (rev.): 5.—Nikolskaya, 1963, Keys Fauna U.S.S.R. 44: 497 (Eng. transl.).

This species differs from all other Nearctic ones of this genus in being almost entirely bright metallic blue or blue-green, in having the scutellum elevated rather than flat and having longitudinal, lineolate sculpture, and in lacking the double row of minute teeth on the ventral side of the midtarsal segments (in *metallica* these teeth are replaced by short spines). The female gaster of this species is also only moderately lengthened and is scarcely acuminate apically. It may be desirable to place *metallica* in some genus other than *Calosota*.

Female.—Length 2.5–4.0 mm. Head and body bright metallic blue or blue-green with iridescent green or purple luster on pleura; antennal scape metallic blue, pedicel green, flagellum dark brown or black; coxae metallic blue or lavender, femora and tibiae pale tan or yellow at bases and apices, middle parts blue or blue-green, tarsi tan with apical segment of each brown; wings hyaline with yellow veins. All pubescence silvery.

Antennae inserted very slightly below level of ventral margins of compound eyes; basal funicular segments slightly longer than wide, apical ones wider than long, pedicel 4 times as long as first funicular, second funicular twice as long as first, third to fifth equal in length and each 1 1/4 times as long as second, sixth and seventh equal in length and each 9/10 as long as fifth, eighth 4/5 as long as fifth, club 3 times as long as fifth, first club segment 1/2 as long as club; width of malar space 3/5 as great as height of compound eye; ocellular line 1/7 as long as postocellar line.

Mesoscutum and praescutum with minute, net-like sculpture, scutellum with this sculpture so modified as to form closely set, longitudinal striae; scutellum not flat but very slightly depressed on meson in basal half, posterior half with surface slightly elevated and rounded; prepectus with sculpture similar to scutum; mesopleuron almost smooth, but with faint coriaceous sculpture, the lines of this sculpture transverse in anterior half, becoming longitudinal in posterior half; forewing with stigmal and postmarginal veins usually equal in length (postmarginal sometimes slightly the longer), marginal vein 4 times as long as stigmal, a relatively broad speculum along basal vein, fig. 4; mid tarsus with spines rather than teeth on ventral surface; apical spur of mid tibia relatively weak.

Propodeum almost smooth, with faint alutaceous sculpture; propodeal spiracles not set in depressions. Gaster subflattened dorsally, as wide as thorax, and twice as long as thorax; basal 2 terga emarginate on meson of posterior margin; seventh tergum 2/3 as long as sixth; ovipositor slightly exerted.

Male.—Length 2.0–3.0 mm. Color and sculpture as in female; first funicular segment 1/4 as long as pedicel, second funicular 2 1/2 times as long as first, third to eighth equal in length and each 1 1/5 times as long as second; club almost 3 times as long as eighth funicular, first club segment 1/3 as long as club; width of malar space 1/3 as great as height of compound eye; ocellular line 1/9 as long as postocellar line. Length of propodeum on meson 2/3 as great as length of postscutellum; gaster shaped as in female, but only 1 1/4 times as long as thorax.

Type-locality.—San Miguel, California.

Type.—U. S. N. M. Catalog No. 24988.

Distribution.—Idaho, Utah, Wash., Oreg., Calif.

Biological relationships.—Associated with grasses, attacking various hosts in the stems. This has been reared as a primary parasite of several species of *Harmolita* and, as a secondary parasite, from *Ditropinotus aureoviridis* Crawford and *Eurytoma parva* Phillips, these 2 being primary parasites of *Harmolita*. It also has been reared as a primary parasite of *Mayetiola destructor* (Say).

Calosota longiventris (Ashmead)

Calosoter longiventris Ashmead, 1896, Proc. Ent. Soc. Wash. 4: 12, ♀, ♂.—Dalla Torre, 1898, Cat. Hym. 5: 270.—Schmiedeknecht, 1909, Gen. Ins., fasc. 97: 185.

Calosota longiventris (Ashmead) Peck in Muesebeck et al., 1951, U.S. Dept. Agr. Monog.

2: 508.—Peck, 1963, Canad. Ent. Suppl. 30: 474.—Burks in Krombein and Burks, 1967. U.S. Dept. Agr. Monog. 2, Suppl. 2: 245.

This species differs from all other North American species of *Calosota* in having the seventh gastral tergum of the female so greatly lengthened that it is 4 times as long as the sixth tergum.

Female.—(Redescribed from the single fragmentary lectotype specimen.) Length 6.0 mm. Head, thorax and propodeum black with faint metallic green luster, gaster black; antennal scape black with faint metallic bronze luster, pedicel and flagellum black; coxae black with very faint bronze luster, femora and tibiae dark brown, tarsi slightly lighter; wings hyaline, veins brown. Pubescence silvery.

Antennae inserted slightly below level of ventral margins of compound eyes; pedicel and funicular segments elongate, pedicel 5/6 as long as the combined first and second funiculars, first funicular 1/2 as long as second, second to fourth equal in length, fifth and sixth each 5/6 as long as fourth (apical parts of antenna missing); width of malar space 1/2 as great as height of compound eye; ocellular line 1/4 as long as postocellar line.

Entire dorsum of thorax with minute, slightly irregular, netlike sculpture, this formed by minute raised lines; median, longitudinal band on praescutum slightly depressed and having surface sculpture a little coarser than elsewhere on dorsum; prepectus sculptured as is mesoscutum; mesopleuron with faint, longitudinal, semi-lineolate sculpture; forewing with marginal vein 3 times as long as stigmal, postmarginal 1 1/3 times as long as stigmal; speculum absent; scutellum flattened.

Propodeum faintly sculptured, almost smooth; posterior margin of propodeum slightly elevated as a low lamina, this touching anterior margin on meson; spiracles of propodeum not in depressions. Gaster elongate, slender, 5 times as long as thorax; seventh tergum greatly lengthened, 4 times as long as sixth tergum; ovipositor projecting from a distance 1/6 as great as length of seventh tergum.

Male.—Length 3.0–4.0 mm. Head black with faint brassy luster; thorax black, faintly metallic green laterally; propodeum shining black, gaster black with faint iridescent luster; antenna stouter than in female, scape widened apically and funicular segments thicker and shorter than in female; pedicel twice as long as first funicular, second 1 2/5 times as long as first, second to fifth equal in length, sixth 7/8 as long as fifth, seventh and eighth equal in length and each 5/6 as long as sixth, club as long as 3 apical funiculars; width of malar space 2/5 as great as height of compound eye; ocellular line 1/6 as long as postocellar line; gaster 2 1/3 times as thorax.

Type-locality.—Santa Cruz Mountains, California.

Types.—Lectotype female, U. S. N. M. Catalog No. 3463. Specimen labeled,

“Sta. Cruz Mts. Cal., *Calosoter longiventris* Ashm. ?.” Present designation of lectotype. There also are 2 male paralectotype specimens in the collection, 1 labeled as is the type, the other labeled, “Argus Mts. May 91 K.”

Distribution.—Idaho, Calif.

Biological relationships.—Unknown.

Calosota kentra, new species

This species agrees with *longiventris* Ashmead in that it has a long, slender gaster with an exerted ovipositor, but they may be separated by the fact that this species has shaded wings, the seventh gastral tergum is only as long as the sixth, and the stigma of the forewing is enlarged and has a long, slender uncus, fig. 2.

Female.—Length 4.0 mm. Head black, with faint iridescent blue luster on face and at eye margins, scrobe cavity lavender; thorax black with faint metallic blue luster at apices of scutellum and postscutellum, and at posterior margin of mesepisternum; propodeum dark metallic blue; gaster black with basal tergum metallic blue; antennal scape dark blue-green, pedicel and flagellum black; coxae dark metallic blue; femora and tibiae black, shading to tan at apices, tarsi tan with apical segment of each dark brown; wing veins light brown, forewing shaded with tan on disc below marginal vein and around stigmal vein; hindwing hyaline. All pubescence silvery.

Antennae inserted slightly below level of ventral margins of compound eyes; antenna with all funicular segments elongate, first funicular segment 1/2 as long as second, the second to fourth funiculars equal in length, fifth 9/10 as long as fourth, sixth 9/10 as long as fifth, seventh slightly shorter than sixth, eighth slightly shorter than seventh, club twice as long as second funicular, first club segment 1/2 as long as club; width of malar space 2/3 as great as height of compound eye; ocellular line 1/3 as long as postocellar line.

Entire thoracic dorsum with slightly irregular, minute, netlike sculpture, this formed by minute raised lines; prepectus with similar sculpture; mesopleuron faintly sculptured, almost smooth; forewing with marginal vein twice as long as postmarginal and 1 3/5 times as long as stigmal, the stigma enlarged and with a long, slender uncus, fig. 2; speculum absent; scutellum flattened.

Propodeum with surface shagreened, posterior margin carinate, this margin in contact with anterior margin on meson, numerous short carinae extending anteriorly from posterior margin in lateral areas of propodeum. Gaster slender, twice as long as thorax; seventh gastral tergum as long as sixth; ovipositor exerted for a distance 1/2 as great as length of sixth tergum.

Male.—Unknown.

Type-locality.—Albany, New Hampshire.

Type.—U. S. N. M. Catalog No.

2, 1958, by W. J. Morse.

Biological relationships.—Unknown.

Cecidostiba montana, new species

This species greatly resembles the European species *vernalis* Curtis in having the frons iridescent blue-violet shading to green on the vertex, the thoracic dorsum has alternating longitudinal blue and greenish bronze stripes, the propodeum is blue-violet, and the hind tibiae are entirely brown in contrast with the anterior and mid tibiae, which are mostly black with faint metallic green luster, the apices tan. They differ in that the sixth and seventh gastral terga are equal in length in *vernalis*, but the sixth is longer than the seventh in this species.

Female.—Length 4.5 mm. Head metallic blue-violet, shading to green on vertex; dorsum of thorax with a blue longitudinal stripe at each lateral margin and on meson, with 2 metallic greenish bronze stripes between the blue ones; thoracic pleuron and sternum blue-violet; coxae dark blue-violet, femora black with faint green luster, apices tan, anterior and mid tibiae the same color, hind tibiae uniformly dark brown, all tarsi pale tan with apical segment of each darker; wings hyaline, veins brown; propodeum blue-violet; gaster black with blue luster ventrally. All pubescence silvery.

Antennae inserted slightly below level of ventral margins of compound eyes; basal funicular segments of antenna elongate, apical ones semiquadrate, pedicel 1 1/4 times as long as first funicular segment, second and third funiculars each as long as pedicel, fourth 9/10 as long as third, fifth 9/10 as long as fourth, sixth and seventh each 4/5 as long as fourth, eighth 2/3 as long as fourth, club twice as long as pedicel, basal club segment not quite 1/2 as long as club; width of malar space 3/8 as great as height of compound eye; ocellular line 1/4 as long as postocellar line.

Entire thoracic dorsum with slightly irregular, minute, netlike sculpture, this formed by minute raised lines; prepectus with similar sculpture; mesopleuron with similar sculpture in anterior half, posterior half with much fainter and finer reticulate surface sculpture; forewing with marginal vein 1 2/3 times as long as postmarginal and 2 1/2

times as long as stigmal; a narrow speculum along basal vein; scutellum flattened.

Propodeum with surface shagreened, posterior margin strongly carinate, this margin not quite touching anterior margin on meson; a pair of longitudinal, submedian carinae present just behind lateral margins of scutellum; numerous short, stout carinulae extending anteriorly from posterior margin in lateral areas of propodeum; each propodeal spiracle situated in a depression that is surrounded laterally and posteriorly by a low ridge. Gaster 2 1/2 times as long as thorax; basal 5 gastral terga medianly emarginate on posterior margin; sixth tergum 1 1/7 times as long as seventh.

Male.—Length 3.5 mm. Head black with very faint metallic green luster on ventral half, faintly iridescent bronze-green on vertex; thorax black with faint metallic blue luster on dorsal meson and on pleura; gaster black with faint iridescence laterally; legs and wings colored as in female; antennal pedicel 2 1/2 times as long as first funicular segment, second funicular 2 1/4 times as long as first, third and fourth each as long as second, fifth 7/8 as long as fourth, sixth to eighth equal in length and each 2/3 as long as fourth, club as long as apical 3 funiculars, first club segment 1/3 as long as club; width of malar space 2/3 as great as height of compound eye; ocellular line 1/6 as long as postocellar line; gaster 1 1/2 times as long as thorax.

Type-locality.—Rock Creek, Granite Co., Montana.

Type.—U. S. N. M. catalog no. 72483.

Described from 1 female, 1 male specimens. Type female, Rock Creek, Montana, reared Feb. 11, 1969, from unidentified gall on *Pinus contorta*, by J. G. Bringuel under his accession no. 1602; allotype male, same data, but reared Feb. 10, 1969, under accession no. 1601.

Biological relationships.—Essentially unknown; may parasitize some gall maker on pine.

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